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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/040,395	01/07/2002	Cheisan J. Yue	P01,0365	2072

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EXAMINER	
HU, SHOUXIANG	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 04/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/040,395	YUE ET AL.	
	Examiner	Art Unit	
	Shouxiang Hu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 January 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) *1-20, 30* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *21-29 and 31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claim1-20 and 30 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, according to the previous office action. As a result, claims 1-31 are pending in this application; and claims 21-29 and 31 remain active in this Office action.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 21, 22, 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Litwin et al. ("Litwin"; US 6,100,770).

Litwin discloses method (see Figs. 1-2 and 10-13, also see col. 6, lines 10-17, and col. 8, line 52, through col. 9, line 42), comprising: forming a plurality of alternating first conductivity-type wells (the first conductivity-type doped regions between the second conductivity type regions 91 in the big well region 82) and heavily doped second conductivity type regions (91; P+) in a bulk silicon layer (81) such that each of the first conductivity type wells forms a first PN junction with the heavily doped second conductivity type region on one side and a second PN junction with the heavily doped

second conductivity type region on the other side; forming a plurality of gate oxides (within a big oxide layer), wherein each of the gate oxides is formed above a corresponding one of the first conductivity type wells; forming a plurality of polysilicon gates, wherein each of the silicon gates is formed above a corresponding one of the gate oxides; electrically coupling each of the polysilicon gates together; and, electrically coupling each of the heavily doped second conductivity type region regions together.

Although Litwin does not expressly disclose that the first and second conductivity types can also be P and N types, respectively, in the specific embodiment of Figs. 10-13, one ordinary skill in the art would readily recognize that a pMOSFET-type varactor (P-type source/drain regions with N-type-doped channel regions) can be desirably and readily formed by simply reversing the doping polarity of the nMOSFET-type varactor (N-type source/drain regions with P-type channel regions), as further evidenced in Litwin. As shown in Figs. 1 and 2 in Litwin, the nMOSFET-type varactor shown in Fig. 2 can be desirably and readily formed by simply reversing the doping polarity of the body region (12) and the source/drain region (13 and 14) of the pchannel MOSFET-type varactor shown in Fig. 1.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the making of the n-channel MOSFET-type varactor into the method of making of the varactor of Litwin, as further taught in Litwin, so that a method for making a varactor with a desired channel type would be obtained.

Regarding claim 28, Litwin further teaches that each of the silicon gates can have a width-to-length ratio in a range covering a ratio of approximately 16 to 1 (see col.6, lines 10-17).

4. Claims 23, 24, 26, 27, 29 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Litwin et al. ("Litwin"; US 6,100,770) in view of Chiang et al. ("Chiang"; US 5,038,184) and/or tang (US 5,563,438).

The disclosure of Litwin is discussed as applied to claims 21, 22, 25 and 28 above.

Although Litwin does not expressly disclose that the channel forming silicon layer can be formed overlying an insulation layer, Chiang teaches that such a silicon-on-insulator-type substrate can be desirably used to form fully depleted channel regions so as to increase the capacitive switching ratio of the varactor (see Figs. 2-3 and 7; also see col. 4, lines 26-36, col. 5, lines 14-16, and col. 7, lines 32-35), which naturally includes a floating body region between the source/channel junction and the drain/channel junction both extending from the top to the bottom of semiconductor layer (42). And, one of ordinary skill in the art at the time the invention was made would readily recognize that silicon-insulator substrates of both the silicon-on-oxide type (SOI type, which normally naturally includes a highly resistive silicon bottom layer) and the silicon-on-sapphire type (SOS) had become readily available for either N-channel or P-channel type MOS devices, as evidenced in Tsang (see col. 3, lines 36-37).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the silicon-on-insulator varactor structure of Chiang into the method of making of the varactor of Litwin with the substrate being either an SOI type or an SOS type, as taught in Tsang, so that a method for making a varactor with increased capacitive switching ratio would be obtained.

Response to Arguments

5. Applicant's arguments filed on January 9, 2004, have been fully considered but they are not persuasive.

6. Applicant's main arguments include: Litwin and/or Chiang fail to disclose that the source/drain regions and the well regions in Figs. 10-13 are of respectively opposite conductivity types with respect to that of the claimed invention; and that there lacks suggestion or motivation to change such conductivity types to the ones of the claimed invention. In response, it is noted that the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, as also evidenced in Figs. 1 and 2 of Litwin, one ordinary skill in the art would readily recognize that a pMOSFET-type varactor (P-type source/drain regions with N-type-doped channel regions; a p-n-p polarity, as shown in Fig. 1) can be desirably and

readily formed by simply reversing the doping polarity of the nMOSFET-type varactor (N-type source/drain regions with P-type channel regions; an n-p-n polarity, as shown in Fig. 2), as each of these two opposite polarity types of varactors is commonly used in the art for accommodating different polarity requirement in the circuits. And, it would be well within the ordinary skill in the art to incorporate the making of a p-n-p polarity type varactor into the method of making of the varactor of Litwin, per the further teaching of Litwin, so that a method for making a varactor suitable for desired circuit polarity requirement would be obtained.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-

1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
April 13, 2004

SHOUXIANG HU
PRIMARY EXAMINER